

POST-GLACIAL CHANGES IN VEGETATION AND  
CLIMATE IN NORTHERN NEW ENGLAND

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**SUMMARY.** Quaternary research in several disciplines has produced strong independent evidence about the post-glacial vegetation and climate of northern New England and adjacent Canada. Late-glacial environments in the region included extensive areas of treeless tundra—more so than was the case in glaciated areas of mid-continental North America. Tree taxa spread gradually from the south, with most current forest elements present by the early Holocene. Subsequent changes in climate have greatly affected the distribution and abundance of those taxa.

Stratigraphic changes in physical and biological characteristics of lake sediments indicate that early to middle Holocene temperatures were as much as 2°C warmer and that the moisture balance (precipitation minus evaporation) was considerably lower than today. These reconstructions are consistent with known orbital variability (especially precession of the equinoxes) which resulted in as much as 8% more summer insolation than at present.

Several lines of paleoecological data corroborate this paleoclimatic reconstruction. White pine (*Pinus strobus* L.) was widespread and abundant in the early to middle Holocene, probably because frequent fires created conditions favorable for seedling establishment. During that same time, both white pine and hemlock [*Tsuga canadensis* (L.) Carrière] were present at elevations as much as 300 to 400 m higher than their present upper limit in the White Mountains of New Hampshire and the Adirondack Mountains of New York.

Conditions changed considerably during the past few thousand years, however, as the climate became cooler and moister. Fossil-pollen evidence shows that the distribution of white pine, which had been so extensive during the drier early and middle Holocene, has diminished consistently during the past 4000 years. This decline appears to have resulted from a reduction in frequency of forest fires during the late-Holocene shift toward a cooler, moister climate.

Within the past 1000 years, populations of several boreal forest

taxa, including spruces (*Picea* spp.) and balsam fir [*Abies balsamea* (L.) Miller] expanded along the southern margins of their distribution in Canada and the northern tier of the United States—from Minnesota to Maine. The strong expansion of spruce in the Great Lakes-New England region, especially the past 500 years, appears to have been associated with summer cooling of about 1°C during the Little Ice Age.

What can be said about the future? General Circulation Model (e.g., NCAR CCM3) projections for a future with twice the present atmospheric concentration of CO<sub>2</sub> suggest that both summer and winter conditions in northern New England may be as much as 3°C warmer than at present and that precipitation may also be greater. If the models are correct, the summer conditions may be as warm as or warmer than those 6000 to 8000 years ago, but possibly also wetter.